Volume 7 • Issue 2

December 2014

The Stream Line

On Kentucky's State Revolving Fund (SRF) Program

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Kentucky UNBRIDLED SPIRIT

Community Spotlight: City of Danville

First Rate in the "City of Firsts"

Danville Kentucky's Approach to Assuring Long-Term Compliance

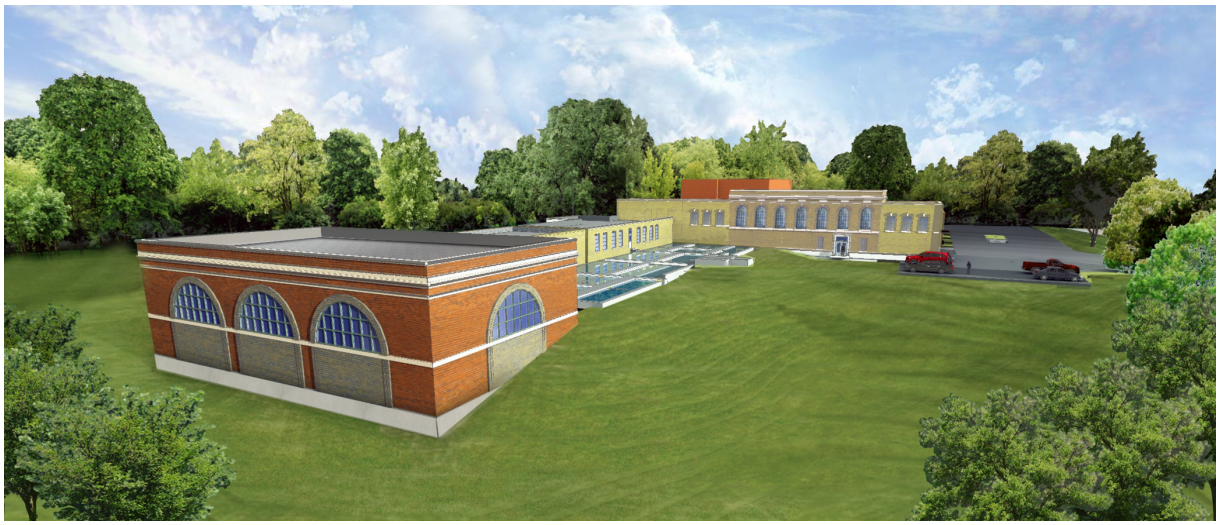
By Brent Tippey, P.E.

Danville, Kentucky, is certainly the historic "City of Firsts" in central Kentucky. Known for being the first capital of Kentucky (1785), having the first courthouse west of the Alleghenies and more recently for hosting two Vice-Presidential debates in its idyllic setting. The city has seen tremendous change since its founding in 1784. The city now prepares for significant change to its water treatment plant facilities.

Danville supports the needs of the region by providing potable water to approximately 70,000 retail and wholesale customers in Boyle and surrounding counties. To meet these needs, Danville produces water at the Coldiron-Watkins Water Treatment Plant. The treatment plant is a conventional plant originally constructed in 1924 with subsequent process upgrades in 1952, 1957, and 1966, and minor projects completed in the 1990s. The plant's performance remains steady thanks to excellent operations. The ability to meet the Environmental Protection Agency's Stage 2 Disinfectants/Disinfection By-Products (D/DBP) Rule created concerns about whether the existing process approach could reliably produce water that was compliant with impending regulatory initiatives. Concern amplified due to the variable raw water quality that Danville receives from its primary raw water source, Lake Herrington. The lake is deep with a modest surface area and prone to seasonal total organic carbon spikes, manganese events and lake turnover. The Danville intake withdraws water at two distinctly different levels in the lake that creates additional variables for treatment.

Acknowledging the challenges they faced, Danville performed investigations into possible advanced treatment options as far back as 1998. These investigations led them to consider and pilot test multiple process modifications as well as consider seasonal changes in their coagulants to improve total organic carbon (TOC) removal as well as lake level draw strategies.

As urgency grew in recent years, Danville focused on identifying a long-term approach to meet their DBP/TOC reduction goals. In 2010, they conducted in-plant testing on granular activated



Architectural rendering of the completed Danville Water Treatment Plant. Courtesy of Bravura Architects

Community Spotlight, cont.

carbon (GAC) to understand reduction potential, media expenditure rates, regeneration costs along with other aspects of the GAC. In 2011, Danville retained the engineering firm, HDR, to follow up on these initial compliance activities and produce a comprehensive approach that would provide the city security that it meets the EPA's D/DBP rule.

HDR reviewed the work performed to date and recommended a brief review of the available options as part of their overall approach. This enabled HDR to review the benefits of multiple treatment processes and how they might fit in Danville. Further, the review included site visits to several installations for different technologies including Kruger's ACTIFLO®CARB technology, Orica's MIEX technology and GAC contactors.

Each option showed promise but ultimately, Danville selected a process approach that included:

- Conventional two-stage flocculation
- Plate settlers
- Granular media filtration
- GAC contactors (8 x 40 mesh)
- MIOX disinfectant (Danville had previously switched to this disinfectant)
- Liquid chemical feed systems – new storage and feed systems

Upon selection of this approach, the city retained the University of Colorado to perform multiple rapid small-scale column tests (RSSCTs) in order to ground-truth the GAC media assumptions. This testing confirmed many of the assumptions that HDR and Danville had developed. Table 1 provides a summary of the findings.

Table 1
RSSCT Findings

Item	RSSCT Results
DOC (untreated)	3.1 – 3.9 mg/1
Coagulant conditions	Ferric 20-25 mg/1
Coagulated DOC	1.9 - 2.1 mg/1
Coagulated THMs[1]	104 – 106 ug/1
Coagulated HAAs[1]	58 – 69 ug/1
Target DOC through Contactors	1.5 mg/1
Coag + GAC THMs[1]	62 – 64 ug/1
Coag + GAC HAAs[1]	29 – 45 ug/1
THM Reduction % - @ Target TOC	40 – 41%
HAA Reduction % - @ Target TOC	36 – 50%
Projected Carbon Use Rate	0.1 – 0.2 lb/1000 gal
Predicted Breakthrough[2]	300+ days
EBCT	15 min Notes

[1]5-day Simulated Distribution System testing result to approximate DBP formation
[2]Under parallel reactor operation

Aerial view of project site under construction. Photo by Sky Shots Blimpcam

These findings confirmed the feasibility of the approach. Subsequently, the development of a plan to optimize the media life has been developed in order to balance the costs of media replacement with the benefits of high quality effluent. Seasonal reductions in Empty Bed Contact Time (EBCT) or partial bypassing were components of the plan.

As noted previously, this project is a comprehensive modernization of the Danville water plant and many complexities exist. The renovated facility must remain at the current location. Many of the existing plant facilities have a heritage and a classical architecture that must remain a part of the new facility. These became important elements in the project. The community demonstrated involvement in this design through public meetings, advisory committees and citizen interest. This resulted in a product of which Danville and HDR are very proud.

Project design completion occurred in the fall of 2013. Construction bids opened on Oct. 8, 2013. Judy Construction Co. received the contract award based on a low bid of $23,789,000. This bid was below the engineer's estimate of $24,500,000. A ground breaking in late January 2014 allowed actual construction to begin on March 3, 2014. It will take approximately two years to complete the project due to the complication of working on an existing site and the need to keep the existing plant in service at all times.

News You Can Use

SRF Binding Commitments, June 2014 to December 2014

June 2014
Fund A (Clean Water)
- Lexington-Fayette Urban County Government-$19,837,063

Fund F (Drinking Water)
- North Middletown-$680,000
- Flatwoods-$325,000

July 2014
None

August 2014
None

September 2014
Fund A (Clean Water)
- London-$4,371,452
- Catlettsburg-$2,485,000
- Augusta Regional Sewer Authority-$600,000

October 2014
Fund A (Clean Water)
- Owensboro-$3,975,000

October 2014 - continued

Fund F (Drinking Water)
- Cumberland County Water District-$1,268,000
- Western Lewis-Rectorville Water & Gas District-$1,266,500
- Henry County Water District #2-$2,800,000

November 2014
Fund A (Clean Water)
- Morganfield-$2,642,200

Fund F (Drinking Water)
- Northern Kentucky Water District-$4,000,000
- Pineville-$220,000

December 2014
Fund A (Clean Water)
- Lexington-Fayette Urban County Government-$36,000,000
- Frankfort-$3,731,000
- Harrodsburg-$1,420,000

Fund F (Drinking Water)
- Lebanon-$3,230,000
- Monroe County Water District-$8,000,000
- Campbellsville-$6,428,000
- Fleming-Neon-$143,616

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